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DRAGONFLIES (ODONATA) FOUND IN THE CENTRAL OF IRAN

(THE NORTH-WEST OF ISFAHAN PROVINCE)

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ABSTRACT

Twenty-eight species of Odonata, including Coenagrionidae (6species), Lestidae (2 species), Calopterygidae (1 species), Euphaeidae (1species), Platycnemididae (1 species), Libellulidae (14 species), Aeshnidae (2species), Cordulegastridae (1 species) were collected between April 2012 to November 2012 from 10 localities north-west of Isfahan, Iran. This list is certainly incomplete, since only two of the four species previously known from the same area were recovered, and Gomphids, known to be present, could not be collected at all. Still, *Sympetrum flaveolum* (Linnaeus, 1758) is a new record for Iran, and 26 species are first records for Isfahan province. Most species found are Palaearctic, often restricted to the east Mediterranean, or typical of arid climates. Those few that are of Oriental origin range much further to the west, usually reaching western Anatolia, or even eastern Europe. It would certainly be justified to continue this study effort, since numerous species that appear to be absent may have been overlooked or may be found in unstudied parts of the Province.

KEYWORDS: Odonata, Dragonflies, *Sympetrum flaveolum*, Iran, Isfahan Province

INTRODUCTION

Odonata or dragonflies, one of the most ancient groups of insects, are classified into three suborders: dragonflies *sensu strictu* (Anisoptera), damselflies (Zygoptera), and Anisozygoptera, Around 6,000 extant species had been described up to 2010 (30 families, 652 genera) (Dijkstra *et al.,* 2013). The larvae of the dragonflies are aquatic, while the adults are active terrestrial flyers. However, they remain dependent on aquatic ecosystems for feeding and reproduction. They prey exclusively on living items in both the larval and adult life stages, and their larvae are important predators of various macroinvertebrates, including mosquitoes (Saha *et al*., 2012). Several laboratory and field studies have reported an effective reduction of mosquito populations by dragonfly larvae (Laird, 1973; Corbet, 1980; Quiroz-Martınez & Rodrıguez-Castro, 2007), making them a potentially important tool in fighting malaria and other mosquito-borne parasitic diseases of humans and cattle. Odonate larvae are also important organizers of aquatic community structure, and are among the top-predators of the aquatic ecosystem of temporary pools, which are common in the area studied, and in which vertebrate predators are absent or rare (Lounibos *et al*., 1987; Blaustein & Dumont, 1990; Blaustein & Margalit, 1994; Fincke *et al*., 1997; Blaustein, 1998).

Odonata larvae also require specific habitat conditions, and because of this, they are widely used as ecological indicators of habitat quality and of the integrity of freshwater ecosystems (Hardersen, 2000; Sahlen & Ekestubbe, 2001;

Smith *et al*., 2007; Silva *et al*., 2010; Arimoro *et al*., 2011; Simaika & Samways, 2011; Dolny & Harabis, 2012, Dolny *et al*., 2012). They are thus an important and useful order of insects, but in spite of this, our knowledge of the odonato fauna of Iran is far from adequate. Following the review of the fauna of Iran by Schmidt (1954), it took a long time before additional records were published. To illustrate the need for further fieldwork, nine new species for Iran were collected during only four days of fieldwork by Dumont & Heidari (1996). In a recent checklist published by Heidari & Dumont (2002), 95 species were listed, ranking Iran among the species-rich countries for Odonata, comparable to Turkey (Dumont, 1977; Kalkman *et al*., 2004; Kalkman, 2006). A number of local studies (Sadeghi & Dumont, 2004; Ghahari *et al.*, 2009; Sadeghi & Mohammadalizadeh, 2009; Kiany & Minaei, 2009; Ebrahimi *et al.*, 2009; Dumont *et al*., 2011) have since reported few additional species, and explored the fauna of Teheran, Fars and Kerman provinces, as well the Caspian coastal fringe, yet vast areas of the country have remained almost unexplored, among them the centrally situated Isfahan Province. Only four species had to date been reported from this large province (Heidari and Dumont, 2002).

Isfahan (also written as Esfahan) Province is situated between the central Zagros mountain range and the grand desert. The north-west of the province is partly mountainous, partly a plain and consists of 3 bioclimatic zones: sub-humid and cold (Golpayegan, Khonsar), semi-arid and cold (Meyme) and semi-arid and warm (Kashan). Overarching this large variety of habitats is the fact that across the entire region natural water resources are scarce, with no permanent rivers and almost all water resources lotic and semi-lotic reservoirs that form part of a giant network of artificial irrigation canals.

MATERIALS AND METHODS

We collected adult dragonflies and damselflies from April to November 2012, in an area north-west of Isfahan using an entomological net (net opening about 45cm wide, extensible handle lengths about 50-180 cm). The main collecting localities are shown in Figure 1. Species were identified with the help of Fraser (1956) and Dumont (1991). Photographs of important taxonomic characters were taken with a Dino-Lite Digital Microscope. All specimens have been deposited in the biosystematics research laboratory, Department of Zoology, Faculty of Biological Sciences, Shahid Beheshti University.

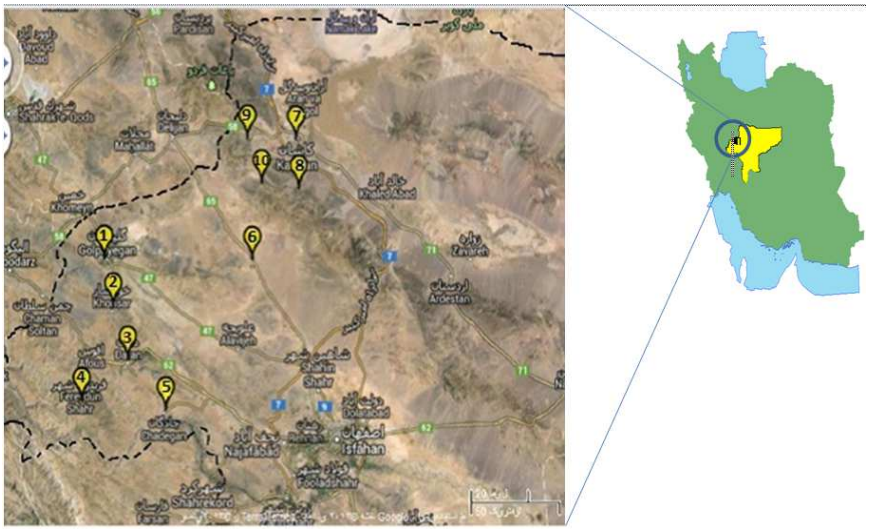

Figure 1: Map of the Study Area, Showing the Main collecting Sites the Numbers Correspond to the Localities Sampled: 1- Golpayegan, 2- Khonsar, 3- Daran, 4- Fereydun Shahr, 5- Chadegan, 6- Meymeh, 7- Kashan, 8- Ghamsar, 9- Niasar, 10- Barzok

Table 1: List of Localities Studied

Locality	N	E	Elv	Type	Running/Standing Water	Bank-Side Vegetation	
						Type	Density
1-Golpayegan	33˚ 26′	50˚ 17′	1821	Natural pool	Standing	Reeds ,trees	High
2-Khonsar	33˚ 13′	50˚ 19′	2250	Dam (Bagh-e-Gol)	Standing	Bushes	Very Poor
3-Daran	32˚ 53′	50˚ 30′	2332	Artificial reservoir and open irrigation canal	Standing and running	Reeds and bushes	Normal
4-Fereydun shahr	32˚ 56′	50˚ 7′	2536	Artificial reservoir	Standing	Bushes	High
5-Chadegan	32˚ 45′	51˚ 41′	2105	Dam and little stream	Standing and slow moving	Bushes and grass	Poor
6- Meymeh	33˚ 23′	51˚ 12′	1964	Artificial reservoir	Standing	Bushes	Normal
7- Kashan	34˚ 2′	51˚ 21′	954, 8	Pond	Standing	Bushes	Poor
8-Ghamsar	33˚ 40′	51˚ 24′	2287	Artificial reservoir	Standing	Bushes	Normal
9- Niasar	33˚ 58′	51˚ 8′	1720	pond and stream	Standing and running	Bushes and trees	Poor
10- Barzok	33˚ 47′	51˚12′	1980	Artificial reservoir and open irrigation canal	Standing and running	Reeds and bushes	Normal

RESULTS AND DISCUSSIONS

We collected 405 adults (241 Anisoptera and 164 Zygoptera,) pertaining to 28 species and 16 genera (11 species, 8 genera of Zygoptera and 17 species, 8 genera of Anisoptera) (tables 2 & 3). One species, *Sympetrum flaveolum* (Linnaeus, 1758), is new to the fauna of Iran.

In previous studies, only 4 species, viz. *Sympetrum meridionale* (Selys, 1841), *Sympetrum fonscolombii* (Selys, 1840), *Diplacodes lefebvrii* (Rambur, 1842) and *Gomphus schneiderii* Selys, 1850) had been reported from Isfahan province (Heidari & Dumont, 2002), so the present study adds 26 species records to the province and one to the country of Iran. However, of these four, *Diplacodes lefebvrii* (Rambur, 1842) and *Gomphus schneiderii* (Selys, 1850) were not recovered, strongly suggesting that our survey missed these as well as a considerable number of other species. The family Gomphidae is a case in point: while we expected at least four taxa in this family, the only specimen we found was a dead and decaying animal that could not be identified beyond family level. Also not found were oriental species like *Pseudagrion* spp., *Anax immaculifrons* and *Orthetrum taeniolatum*, which is unexpected in view of the central position of our sampling area. The few oriental species in our collection (*Trithemis festiva, Orthetrum sabina*) are wide-ranging and extend west as far as western Anatolia and sometimes Greece. Most species are Palaearctic, often restricted to the east Mediterranean area (e.g. *Calopteryx splendens intermedia, Epallage fatime, Platycnemis dealbata. Cordulegaster insignis*), but there also occurs a significant element of arid-zone species, such as *Ischnura fountaineae* and *I. evansi*. Here, however, another typical semi-eremian element to be expected here, *Sympetrum sinaitcum*, was not found. Few species, like *Pantala flavescens* and *Trithemis kirbyi* range widely from the Afrotropical to the Oriental regions, including the Arabian peninsula.

As regards the nature of the biotope, in the absence of gomphids only 4 species, *Platycnemis dealbata, Epallage fatime*, *Calopteryx splendens intermedia* and *Cordulegaster insignis*, were found on running waters; all other species occurred on stagnant waters (including irrigation ditches).

CONCLUSIONS

We conclude that the diversity and abundance of Odonata in north-west Isfahan province is largely determined by the vast network of artificial irrigation canals that provides favorable conditions for the larval development of many species and so plays an important role in the distribution and occurrence of such insects in the region. These irrigation ditches were only partially covered by our study. Furthermore, there are numerous aquatic sites in the east of the province that await being studied. It is therefore highly likely that additional species will be discovered, including those cited above as missing, by studying these habitats.

Table 2: List of Species of Zygoptera Recorded North West of Isfahan the Numbers Refer to the List of Localities * Identifies Species with a Preference for Arid and Semi-Arid Climates, + Identifies Species with an East Mediterranean Geographic Range

NO	Family	Species	Locality	Collection date	Status In Collection Date	Records	
						Male	Female
1	Calopteryg idae	*Calopteryx splendens intermedia* (Selys, 1887) +	*3*	18 July 2012	scarce	3	0
2	Coenagrion idae	*Enallagma cyathigerum risi* (Ris) *	2-5	18 July 2012	common	8	2
3	Coenagrion idae	*Erythromma viridulum orientale (Schmidt, 1960)*	*5*	18 July 2012 10September 2012	common	8	0
4	Coenagrion idae	*Ischnura fountaineae (*Morton, 1905)*	*5*	15 September 2012	rare	0	1
5	Coenagrion idae	*Ischnura elegans* (Vander Linden, 1825)	1-3- 5-4-6-8-10	July 2012 September 2012	Very common	70	1
6	Coenagrion idae	*Ischnura evansi (*Morton, 1919) *	*5-10*	18 July 2012	uncommon	0	10
7	Coenagrion idae	*Ischnura pumilio* (Charpentier, 1825)	*5-10-1*	11 September 2012	Very common	27	15
8	Euphaeidae	*Epallage fatime* (Charpentier, 1840) +	*9*	3 July 2012	uncommon	3	0
9	Lestidae	*Lestes barbarus* (Fabricius, 1798)	*3*	18 July 2012	scarce	2	0
10	Lestidae	*Sympecma paedisca* (selys, 1887)	*1*	12 September 2012	scarce	0	3
11	Platycnemi didae	*Platycnemis dealbata (*Selys & Hagen, 1850) +	*9*	3 July 2012	common	7	4
T						128	36

Table 3: List of Anisoptera Recorded North-West of Isfahan. The numbers Refer to the List of Localities. + = east Mediterranean Species

NO	Family	Species	Locality	Collection Date	Stautus in Collection Date	Records	
						Male	Female
1	Aeschnidae	*Anax imperator* (Leach, 1815)	8-10	24 may 2012 ,9 July 2012	uncommon	7	2
2	Aeschnidae	*Anax parthenope* (Selys, 1839)	*7*	29 July 2012	uncommon	1	0
3	Cordulegasteridae	*Cordulegaster insignis (*Schneider, 1845)+	*10*	3June 2012	scarce	1	1
4	Libellulidae	*Crocothemis erythraea* (Brulle, 1832)	*6-10*	26 June 2012, 8 July 2012, 2 September 2012	Very common	29	4

Table 3: Contd.,							
5	"	*Crocothemis servilia* (Drury, 1770)	*6*	2 September 2012	scarce	1	1
6	"	*Libellula depressa* (Linnaeus, 1758)	*8*	9 July 2012	scarce	1	1
7	"	*Orthetrum anceps* (Schneider, 1845)	*6-8*	2 July 2012, 3 September 2012	common	6	8
8	"	*Orthetrum brunneum* (B.de Fonscolombe, 1837)	*6-8-10*	, 9 July 2012, 3June 2012 2 September 2012	Very common	12	30
9	"	*Orthetrum cancellatum* (Linnaeus, 1758)	*9*	3 July 2012	fairly common	2	0
10	"	*Orthetrum sabina* (Drury, 1773)	*6-8-7*	10 July 2012, August 2012 3 September 2012, 5	uncommon	1	1
11	"	*Pantala flavescens* (Fabricius, 1798)	*6-10*	22 July 2012,13 August 2012 10 September 2012	common	9	4
12	"	*Sympetrum flaveolum* (Linnaeus,1758)	*3*	18 July 2012	rare	0	1
13	"	*Sympetrum fonscolombii* (selys, 1840)	*5-6- 8-10*	8,18 July 2012, 3June 2012, 2 September 2012,	Very common	32	30
14	"	*Sympetrum meridionale* (Selys, 1841)	*4*	12 September 2012	Very common	21	9
15	"	*Sympetrum striolatum* (Charpentier, 1840)	*1-10*	12 September 2012 3 October 2012	common	7	10
16	"	*Trithemis festiva* (Rambur, 1842)	*9*	3 July 2012	common	8	0
17	"	*Trithemis kirbyi* (Selys, 1891)	*10*	3 October 2012	scarce	1	0
T						139	102

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